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ABSTRACT

At the Second World Conference on Computers in Education nearly 150 papers were presented. The author gives an overview of the conference, and selects a few of the papers for further discussion. Vendor-supplied computer education, "information science" as a high school elective, and computer-assisted instruction in a broader spectrum of course material are among the topics that are mentioned. In the appendix is a list of all the papers that were presented at the conference. (EMH)

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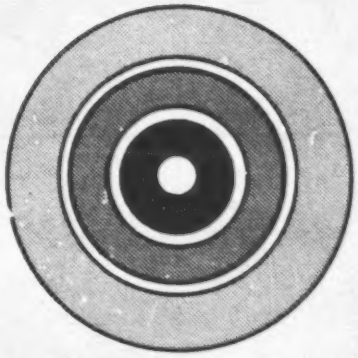
Trip Report:

Second World Conference on Computers in Education of the INTERNATIONAL FEDERATION FOR INFORMATION PROCESSING

MARSEILLE, FRANCE
SEPTEMBER 1975



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MARSEILLE, FRANCE
SEPTEMBER 1975

D.D. HENDERSON

NOVEMBER 1975

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ABSTRACT

This paper presents an overview and evaluation of the International Federation for Information Processing (IFIP) Second World Conference on Computers in Education and summarizes some of the papers I found interesting. While the paper reflects a personal viewpoint, some of the information it contains may prove useful to MITRE people and other colleagues who are involved in one way or another with computing and/or education.

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SECTION 1

CONFERENCE OVERVIEW

The topic "Computers in Education" is an extremely broad one. It was not inappropriate, however, for the extremely diverse subject matter of the recent Second World Conference on Computers in Education, sponsored by IFIP and organized by AFCET (Association Française Pour la Cybernetique Economique et Technique). More than a thousand registrants from over fifty countries met in Marseille, France, during the first week of September 1975 to hear papers and panel discussions in the following areas:

- General education: elementary and secondary, in diverse subject areas (predominantly mathematics and science),
- University education: computer science/informatics primarily
- Business education/vocational education
  - For analysts and programmers for commercial systems
  - For directors of business and industrial computer systems
  - For management
- Teaching teachers, for all the above areas
- Teaching engineers (to build future computers)
- Planning for informatics education
  - IBI (International Bureau for Informatics) plan for developing countries
  - Research in teaching, learning, cognition, motivation
- Uses of computers for administrative support in educational institutions
- Special topics: music, graphics, CAI/CMI

The above classification scheme differs somewhat from the organization of the conference sessions. That organization is shown in Appendix A which reproduces the Table of Contents of the conference edition of the proceedings. (The Appendix, together with the author list, will serve as a key to finding the references.)

Possibly the most striking impression left from attendance at the conference is that of great diversity. It is true that in general the developing countries seem to be most interested in training people to fill positions in commercial and industrial data processing. They are less concerned, for the present, with educational philosophy. But even among the developing countries there is wide variation in the approaches used, in the degree of government involvement and support, and in the educational outcomes anticipated.

In the more developed countries, where sufficient numbers of trained people to staff the computer installations are more readily available, the intellectual concerns have turned to such matters as the extent of need for programs of general education that will improve students' problem-solving skills, and to promoting the use of computers along with other available technology to support problem-solving. There is less emphasis on studying computers themselves, and less concern about training enough technicians to run the machines that exist. Quality of training is still a concern.

The overall quality of the presentations was not as high as might have been expected for an international conference; in most cases, the authors did not comply with the request of the program committee to provide new information, gained since the submission of the papers in October 1974. In those situations in which authors did take the trouble to update their presentations or to provide good quality illustrations, their efforts were often less than successful because of the relatively primitive technical support available. (Only one of the five lecture rooms had a carousel slide projector; overhead projectors are not exactly the wave of the future.)

One participant, who had attended the First World Conference on Computers in Education in Amsterdam in 1970, felt there had been notable progress in educational computing in five years. In 1970 the overall tone would be summarized as "Gee whiz, what are we going to do with all these machines!" he said, whereas in 1975 it was at least "Gee whiz, look at all the neat things we are doing." However, it must also be noted that only a few papers (or authors) asked whether all those activities are worthwhile, or how they fit into a total picture of education. Perhaps by the time IFIP sponsors a third conference on the subject there will be greater overall concern for the proper place of computer education in the context of general education. A healthy trend might be to move away from study of the computer as an interesting technological gimmick and toward the broader study of

information and its uses in a technological society, with emphasis on the use of the computer as one of a number of tools that can help to manipulate data and produce information.

SECTION 2

REVIEW OF SELECTED PAPERS

No general overview papers were presented. A number of sessions were oriented toward programs of curriculum development, government planning for increasing the numbers of computer technicians, and the proper curriculum for a university education in computer science. Information from a collection of papers dealing with these general topics is given in Figure 1. The countries included (except Kenya, which is there to provide contrast) are in general those that sent large numbers of people to the conference and those whose people gave many of the papers (see Table I and II). An attempt was made to show a cross-section of more-developed and less-developed countries, with varying degrees of national governmental support and direction.

The ACM "curriculum 68" and various local and regional adaptations of it have been a significant influence in the development of university-level curricula worldwide. At the same time, there are criticisms, and pleas for taking a broader view than that of either the ACM curriculum or the model curriculum for "Information Systems Designers" sketched out by the IFIP Technical Committee #3 (TC3). (Papers by K. Samuelson, Sweden, and R. Stamper, Great Britain.) A report on progress in the revision of curriculum 68 itself was included in the presentation (G. Engel, USA).

The European Systems Research Institute (ESRI) for the provision of advanced training to IBM World Trade personnel (T. Lincoln, Belgium) is described as an opportunity for IBM's senior technicians in Europe.

	BRAZIL	CANADA	FRANCE	GREAT BRITAIN	HUNGARY	JAPAN
NATIONAL GOVERNMENT AND OTHER SUPPORT AND/OR DIRECTION	BRAZILIAN FEDERAL GOVERNMENT SUPPORT FROM BRAZILIAN NATIONAL RESEARCH COUNCIL COORDINATION OF DATA PROCESSING ACTIVITIES (CAPRE)	NO FORMAL PROGRAM OF NATIONAL GOVERNMENT SUPPORT PROVINCIAL GOVERNMENTS SUPPORT TO COMPUTER NETWORKS	FORMAL PROGRAM IN MINISTRY OF EDUCATION: - PLAN CALCUL - INSTITUTS UNIVERSITAIRES DE TECHNOLOGIE (IUT)	NO FORMAL NATIONAL GOVERNMENT SUPPORT SCHOOLS COMMITTEE OF BRITISH COMPUTER SOCIETY LOCAL EDUCATIONAL AUTHORITIES	SZAMOK THE INTERNATIONAL COMPUTER EDUCATION AND INFORMATION CENTERS CENTRAL COMPUTER DEVELOPMENT PROGRAM	MINORITY OF ED MINISTRY OF TH NATIONAL TRADE INDUSTRY JAPAN COMPUTER DEVELOPMENT IN
ELEMENTARY	VERY LITTLE	VERY LITTLE	VERY LITTLE	VERY LITTLE	VERY LITTLE	VERY LITTLE
SECONDARY	CAI CURRICULUM IN PROGRAMMING TECHNICAL EDUCATION	ACCESS TO UNIVERSITY COMPUTING FACILITIES	SOME USAGE IN A FEW DISCIPLINES	PRINCIPALLY IN MATH AND SCIENCE 14-16 YEAR OLDS	TECHNICAL SCHOOLS ONLY	SOME GOVERNMENT IS ING GROWTH
UNIVERSITY	CURRICULUM DEVELOPMENT THROUGH UNIVERSITY (GOVERNMENT SUPPORT)	COMPUTER SCIENCE VARIED APPROACHES TO GENERAL INTRODUCTIONS COMMUNITY COL. NETWORK	CURRICULUM DEVELOPED FOR IUT	BCS SYLLABUS OUTLINE; OPEN UNIVERSITY - SEVERAL COURSES	7 UNIVERSITIES & 2 COLLEGES HAVE COMPUTER EDUCATION	ALL STUDENTS T SOME COMPUTER EDUCATION BY J
OTHER	VENDOR TRAINING	VENDOR AND COMMERCIAL TRAINING	VENDOR TRAINING COMMERCIAL TRAINING	VENDOR AND ON-THE-JOB TRAINING; CIVIL SERVICE COLLEGE	EXTENSION AND SHORT COURSES BY SZAMOK	VENDORS; COMMER SCHOOLS; ON-THE TRAINING
ADMINISTRATIVE USES IN EDUCATIONAL INSTITUTIONS	LIMITED	WIDELY USED	SOME USE FOR ADMINISTRATION AND PLANNING	WIDELY USED OPEN UNIVERSITY COULD NOT MANAGE ITS 50 000 STUDENTS WITHOUT ADP	LIMITED	LIMITED, BUT G RAPIDLY
EXAMINATIONS/ DEGREES	VARIOUS UNIVERSITY DEGREES	VARIOUS UNIVERSITY DEGREES	DIPLOME UNIVERSITAIRE DE TECHNOLOGIE (DUT) NO MIS PROGRAMS IN SCHOOLS OF BUSINESSES	VARIOUS UNIVERSITY DEGREES; (BSC) ADVANCED CERTIFICATES CERTIFICATES; PROGRAMMERS SYSTEMS ANALYSIS LICENTIATE OF BRITISH COMPUTER SOCIETY BCS; MEMBER BCS	UNIVERSITY DEGREE CERTIFICATES FOR SHORT COURSES	UNIVERSITY DEG JUNIOR COLLEGE TECHNICAL CERT CATIONS
TEACHER TRAINING	UNIVERSITIES (PRE-SERVICE AND IN-SERVICE) PRIVATE INSTITUTES SPECIAL EFFORTS TO TRAIN JUNIOR FACULTY FOR UNIVERSITIES	LIMITED PRE-SERVICE IN-SERVICE; COURSE MATERIALS BEING DEVELOPED; TEACHER GUIDES	FEW COMPUTER-RELATED COURSES FOR PRE-SERVICE TEACHERS PRIMARILY IN-SERVICE FOR ALREADY TRAINED TEACHERS	LIMITED PRE-SERVICE TRAINING IN-SERVICE TRAINING FOR 2500 STUDENTS THROUGH CES	PRIMARILY FOR THE TRAINING OF JUNIOR LEVEL COMPUTER PROFESSIONALS JOB ROTATION POLICY	SOME TRAINING UNIVERSITY STU
TECHNOLOGY TRANSFER	CAI METHODS TO TEACH BASIC PROGRAMMING JOINT INDUSTRY-GOVERNMENT PROJECTS INTERNATIONAL EXCHANGE SPONSORED BY CAPRE	THEORETICAL WORK IN CAI CAI COURSES IN PROGRAMMING AND ACCOUNTING DEVELOPMENT WORK ON STAND-ALONE MICRO-COMPUTERS TO SERVE 300 STUDENTS	INTERACTION BETWEEN PSYCHOLOGY, CAI, AI INDRP INSTITUT NATIONALE DE RECHERCHE ET DOCUMENTATION PEDAGOGIQUE	ICL SUPPORT FOR DEVELOPMENT OF TEACHING MATERIALS COMPUTER EDUCATION IN SCHOOLS (CES) PROJECT	INSTRUCTORS SPEND ONE YEAR IN EVERY 4-5 YRS. IN A BUSINESS/INDUSTRY JOB INTERNATIONAL EXCHANGE PROGRAM	CAI TO TEACH SC INTRODUCTORY CO

HUNGARY	JAPAN	KENYA	U.S.
...OK THE INTER-...UAL COMPUTER ...ATION AND INFOR-...ON CENTERS ...RAL COMPUTER ...LOPMENT PROGRAM	MINORITY OF EDUCATION, MINISTRY OF INTER-NATIONAL TRADE AND INDUSTRY JAPAN COMPUTER USAGE DEVELOPMENT INSTITUTE	NO COORDINATED POLICY FOR COMPUTER EDUCATION	NO OVERALL PROGRAM NATIONALLY NSF SUPPORT TO SELECTED PROJECTS STATE SUPPORT TO SELECTED PROJECTS ACM CURRICULUM PROJECTS
...Y LITTLE	VERY LITTLE	NO COMPUTER EDUCATION	SOME ISOLATED WORK IN CAI
...NICAL SCHOOLS ONLY	SOME GOVERNMENT IS PROMOTING GROWTH	NEED FOR COMPUTER AWARENESS	SOME USE IN 90% OF SECONDARY SCHOOLS
...IVERSITIES & ...LLEGES HAVE ...UTER EDUCATION	ALL STUDENTS TO HAVE SOME COMPUTER EDUCATION BY 1980	ONE ICL 1920A COMPUTER AT NAIROBI UNIVERSITY	COMPUTER SCIENCE CURRICULUM CAI EXPERIMENTS
...SION AND SHORT ...ES BY SZAMOK	VENDORS: COMMERCIAL SCHOOLS, ON-THE-JOB TRAINING	VENDOR TRAINING	VENDOR TRAINING SHORT COURSES; ON-THE-JOB TRAINING
...TED	LIMITED, BUT GROWING RAPIDLY	NONE	WIDELY USED - OVER 50% OF SCHOOL SYSTEMS SURVEYED
...RSITY DEGREE ...FICATES FOR SHORT ...ES	UNIVERSITY DEGREE JUNIOR COLLEGE AND TECHNICAL CERTIFICATIONS	LIMITED OPPORTUNITY FOR UNIVERSITY DEGREE IN COMPUTER SCIENCE	VARIOUS UNIVERSITY DEGREES (CONFERRED BY THE INDIVIDUAL INSTITUTION) CERTIFICATE IN DATA PROCESSING
...ILY FOR THE ...% OF JUNIOR ...COMPUTER PRO-...ALS ...TATION POLICY	SOME TRAINING FOR ALL UNIVERSITY STUDENTS	NONE OF THE STUDENTS IN TEACHER TRAINING HAVE ENROLLED IN COMPUTER COURSES 500 SECONDARY MATH TEACHERS HAVE HAD COURSES IN MODERN MATH INCLUDING FORTRAN	VERY FEW COMPUTER RELATED COURSES ARE OFFERED IN PRE-SERVICE EDUCATION LOCAL IN-SERVICE COURSES ON A VOLUNTARY BASIS
...CTORS SPEND ONE ...H EVERY 4-5 YRS. ...USINESS/INDUSTRY ...ATIONAL EXCHANGE ...M	CAI TO TEACH SOME INTRODUCTORY COURSES		LARGE CAI PROJECTS (E.G. PLATO AND TICCIT) ARPANET UCLA PROJECT WITH 2 BRAZILIAN UNIVERSITIES

FIGURE 1
SOME CHARACTERISTICS OF COMPUTERS IN EDUCATION IN SELECTED COUNTRIES

TABLE I

PRINCIPAL NATIONAL GROUPS AMONG
REGISTERED PARTICIPANTS

COUNTRY	ATTENDEES
FRANCE	247
GREAT BRITAIN	115
GERMANY (FEDERAL REPUBLIC)	74
U.S.A.	67
NETHERLANDS	42
HUNGARY	30
DENMARK	24
POLAND	23
CANADA	22
JAPAN	21
BRAZIL	20

THESE GROUPS ACCOUNTED FOR ABOUT 6[illegible] PERCENT OF ATTENDEES.

TABLE II

PRINCIPAL NATIONAL GROUPS
PRESENTING PAPERS

COUNTRY	NUMBER OF PAPERS
U.S.A.	44
FRANCE	31
GREAT BRITAIN	25
GERMANY (FEDERAL REPUBLIC)	8
CANADA	6
JAPAN	6
NETHERLANDS	5
HUNGARY	4

THESE GROUPS PRESENTED APPROXIMATELY 87 PERCENT OF ALL PAPERS.

ESRI has a prime objective of integration with the rest of IBM European computer education. Both the demand for placement and the satisfaction of the students are said to be high.

A considerably less enthusiastic view of vendor-supplied computer education -- this time with users/customers as students -- is held by a Latin American group (Mora, Molina, and Reyna; Mexico). Dependence on foreigners, especially for computer education, is deplored particularly because the suppliers teach techniques foreign to the Mexican reality and inhibiting to Mexico's social progress. Vendors give "a partial and limited view of the field, focusing on the specific machine of the supplier."

In an extremely characteristic vein, the single presentation given at the conference plenary session (W. Mercouroff, France) touts the careful planning and efficient execution, under France's "Plan Calcul," to introduce informatics into the country's general secondary education. The philosophy of introducing informatics as a tool in support of the disciplines that are traditionally taught in secondary schools seems to be the approach favored by most developed countries. France is not (as claimed) exceptional or original in this approach. Nor is it particularly remarkable that France has created a special "symbolic language for teaching" (Langue Symbolique d'Enseignement: L.S.E): Britain has its "CESIL" (Computer Education in Schools Instructional Language) and Dartmouth's BASIC is ubiquitous in the USA and elsewhere. In fact, France's recent initiatives are

reassuringly within the mainstream of what seems to be the best thinking of educators in most of the developed countries.

A particularly interesting paper on "A Course in 'Information' for the Secondary School" (Longworth, Great Britain) describes a course designed for 12- to 14-year-old students. Through practical experience-based activities the students learn about information collection, analysis, storage, retrieval, and communication, using the computer and other means of information processing as reinforcement. Among other activities, they develop a Headmaster Information System, perform analyses of traffic accident data, and learn about bibliographic information retrieval systems. A comparable course for U.S. junior high school social studies would be a worthwhile project, since the one described is very British in content. The approach could be used with appropriate local information systems for study.

The emphasis on information studies is further supported by two papers from Australia. Pointing out that astronomers do not study "telescope science," W.N. Holmes (IBM Australia) agrees that "What should be studied is the stuff the computer works on." In his conference presentation, Holmes classified the approximately 160 published conference papers: 120 were not doing his thing; 30 or so more,"completely wrongheaded," talking about the study of computers for their own sake; 5 or 10 "doing the right thing" although sometimes for the wrong reasons. Some of the "right things" include teaching about the uses of data in a technological society and teaching general problem-solving skills at every age, in every subject.

Elementary "data science" is already taught (though not always consciously) in primary grades; some elaboration at the secondary level is recommended.

"Employers as well as educationalists must take account of the need for computer education when making long range plans. . . to ensure that appropriate skills are available when required" according to a study performed for the Australian Commission for Advanced Education (B.Z. Ferranti, Australia). Computing education is expected to need to change to ensure a balance among "computing specialists, subject-oriented practitioners and other computer users," with emphasis on "problem-solving." Experience (of businesses) with "unsuitable recruits who had received an acadamic qualification in computer science" has led to an expressed desire "to see education produce practical users of computers. . . able to discriminate between useful and useless applications, and able to manage that precious resource - information."

A number of papers dealing with Computer Assisted Instruction (CAI) and Computer Managed Instruction (CMI) were presented. Generally there were reports of isolated small projects, while a few dealt with larger issues. There are several divergent views of what CAI might be good for. In a talk on the impact of computers on curriculum (P. Suppes, USA), it is suggested that college courses in Old Church Slavonic and other esoteric foreign languages might be developed in CAI packages so that faculty members to teach such courses would not have to be retained. (A sounder approach might be for universities

to give up trying to be all things to all students, and to specialize so that only one or two universities in a large country would teach Old Church Slavonic.)

The PLATO project at Illinois (D. Alpert, USA) has developed courses in accounting, biology, chemistry, mathematics, and English (usage) for large numbers of community college students. The MITRE Corporation's TICCIT hardware with "courseware" in mathematics and English is being tested at Phoenix College, Phoenix, Arizona (F. Morrison, U.S.A) and at Northern Virginia Community College. Both of these projects have chosen to work in course materials that are commonly made available to very large numbers of students. In a survey of the development of CAI, another Illinois faculty member (J. Neivergelt, U.S.A.) concludes there is an underlying need "to develop a craft of writing interactive programs for communication of all kinds" and that there is really no systematic body of information which is of much help, but that testing interactive systems with real students at an early stage is very important.

Costs of CAI projects have not usually been estimated very accurately (J.E. Austin, U.S.A.), nor are the techniques sufficiently well developed to determine what is meant by "cost per student hour" because of disagreements among planners as to the length of time over which the development costs are to be amortized. The real questions appear to be: What costs are appropriate? How do CAI costs per user per year compare with costs per user for a library, a laboratory, an audiovisual department?

"A Canadian Cooperative Computer-Aided Learning Project" (Oliver, McLean, Braham, and Payne; Canada) describes an approach to courseware development that is supported by provincial and national government funds and that involves (1) a policy group of representatives from the colleges to decide what courses should be produced, (2) a project committee (voluntary membership) of teachers, (3) an editorial board that reviews the curriculum for content, and (4) a production group that creates the courseware and the system software. This arrangement sounds rather like the regional educational technology center described in the Carnegie Commission's report The Fourth Revolution: Instructional Technology in Higher Education.[1] Dartmouth's Project COMPUTE (Morton and Luehrmann; U.S.A.) provides a different and equally interesting approach that engages interested teachers on a temporary basis to work with the staff of the Dartmouth computer center to produce course materials in which they are interested. The underlying theory is that "change is produced by active teachers with ideas that come directly out of their experience." The materials developed by COMPUTE are to be made readily available to the instructional community, through commercial publication. COMPUTE receives support from the National Science Foundation.

Future hardware development based on minicomputers or microcomputers or home-based videodisc systems are cited (A. Bork, U.S.A.) as probable future systems for making commercially published teaching materials as readily available as entertainment, once the courseware had been developed and tested in a time-sharing environment.

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[1] Carnegie Commission on Higher Education, The Fourth Revolution: Instructional Technology in Higher Education, McGraw-Hill, New York, 1972.

Columbia University's Director of Computing (R.P. Taylor, U.S.A.) recommends two approaches to "computerless computing." For elementary school levels, he proposes exercises in classifying sets of objects according to some organizing principle which the child can explain. Another sort of problem-solving exercise consists of debugging practices: finding a target object by asking questions with yes/no answers, and treasure hunting ("limited feedback search").

For other students in an introduction to programming, a simple flow chart language (which incidentally teaches students good practices of modular programs) is used. The correctness of the program has to be logically obvious: student programmer teams simulate its execution using test data. (Russman and Taylor; U.S.A.).

SECTION 3

ASSESSMENT

Among my reasons for attending the IFIP Conference were the following:

- To present my own paper
- To improve my vocabulary in technical French
- To reassure myself that Arlington schools are doing reasonable things with respect to computer technology

I am reassured, and satisfied that my reasons were good ones.

Acquiring a time-sharing minicomputer system is appropriate. It will be possible for secondary students in science, social studies, and other disciplines, as well as math, to use the computer as a tool. We are talking about having computer terminals available in the media centers of all the secondary schools.

Using the Hewlett-Packard 9830A programmable calculators, most students will continue to learn BASIC in junior high school math, but the emphasis is on problem-solving.

The minicomputer, with some peripherals, will be located at the Career Center. Business education students and others who are interested will be able to gain experience in running a small computer center.

Students who want to learn programming for business data processing jobs can take a course in COBOL. It will probably turn out to be most economical still to batch-process most of their programs on the equipment in the administrative data center, but some will be run in the time-sharing system.

We are reexamining the value of a course in FORTRAN in high school. It seems more appropriate to offer it only in Adult Education. The students who know BASIC can rather quickly pick up FORTRAN from the Programmed Instruction texts, and there is not enough to FORTRAN to make up a semester course for people who have already used BASIC. A semester course could be offered at the Career Center (day or evening) for people who have not previously had any introduction to programming fundamentals, possibly in conjunction with basic statistics or a review of high school math.

In the course of discussions reviewing the four Arlington School Board educational program goals,(2) we have been considering the addition of a fifth goal that would emphasize critical thinking and problem-solving skills in all disciplines. A task force of the Advisory Council on Curriculum (Arlington citizens with school staff support) is working on a clear statement of such a goal, so that it can be added to the existing ones.

About 20 Algebra II students at Wakefield High School are experimenting with CAI by using the TICCIT course materials at Northern Virginia Community College. Students who want college credit

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(2) Program goals adopted in January 1974:

1. Assure adequate performance in basic reading skills
2. Improve the quality of human relations
3. Increase opportunities for students to grow in capacity for appreciating beauty
4. Assure adequate performance in basic math skills

for the course can pay $6.25 per credit hour to obtain it; those who want just high school credit are not charged any fee under the present arrangement. (The school system, in effect, funds their participation through some complicated fund transfer arrangements.) This seems to be a good opportunity for Arlington schools to evaluate the course materials and the students' attitudes toward CAI without major investment of school funds.

In reporting to my fellow School Board members and to Arlington citizens, I can say with confidence that I believe our school system is on the right track, philosophically and programmatically, in its computer involvement.

APPENDIX A

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* Proceedings available in US through
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